

DRAFT OF A PLAN FOR MALARIA CONTROL IN THE LOWER JAGUARIBE REGION

State of Ceará

by Dr. G. de Souza Pinto

Ceará, June, 1938.

MALARIA CONTROL IN THE LOWER JAGUARIBE REGION (State of Ceará)

A serious outbreak of malaria occurred, a year ago, in the neighborhood of the town of Aracati, reaching several points on the coast and along the banks of the Jaguaribe River. Here the epidemic started and extended to several localities on the Jaguaribe River, decimating the population of that region.

EXTENT AND CHARACTER OF THE EPIDEMIC

The extent and seriousness of this malaria outbreak cannot yet be gauged. The infected zones offer a deeply impressive sight. For example, practically the entire counties of União and Russas are attacked. In these districts we find more than 90% of the population ill, the area embraced including towns, villages, fazendas, large and small properties.

It is desolating that despite the favorable weather conditions of last winter no improvement can be recorded in this zone, which is one of the richest, if not the richest, of the State of Ceará. All over this region one sees magnificent carnauba trees, extensive cotton and cereal plantations, cattle, etc., but all lacking attention due to shortage of labor.

Grave clinical form of the disease and the case fatality show the seriousness of the situation.

In the Aracati region a noticeable decline of the epidemic is recorded, but in the neighboring districts the disease is extending rapidly. Besides the União and Russas counties, already mentioned, the outbreak has reached Limoeiro and Morada Nova counties. The center of the first zone has been but slightly affected but is now seriously threatened. In the latter zone, however, many cases are now being reported.

The local authorities estimate the total number of malaria cases in the entire region at about 60,000. This may be

an exaggeration, but we would probably be right in stating the figure to be from 40,000 to 45,000. Case fatality is much higher than has ever been observed previously and which, as a rule, was 1% in chronic cases. In acute cases deaths rarely ever occur, except in the pernicious type. In the present epidemic the case fatality runs from 15 - 25%. In normal times the number of deaths in the town of Russas does not exceed 200 a year, which is less than one per day. Last May, however, 327 deaths occurred, which gives an average of more or less 11 per day. Including the deaths which occurred in the whole of the county, this figure will total about 400. The total number for the whole region affected by the epidemic is estimated at 800.

#### CAUSE OF GRAVITY OF SITUATION

In 1930, in Natal, Rio Grande do Norte, the presence of a species of *Anopheles* of the genus "*Mysomyia*" was discovered, which up to then had never been found in South America. This fact greatly surprised the eminent entomologist R. C. Shannon, who verified that this mosquito was the "*Anopheles costalis*", or "*Anopheles gambiae*", an African species, and the most dangerous transmitter of malaria on the Black Continent. (1) Soon after this discovery an extensive outbreak of a fever epidemic of extreme gravity and high mortality occurred in Natal and some districts on the coast of Rio Grande do Norte. At that time, when we took over the direction of the health services of that State, we confirmed Shannon's observation that the epidemic was caused by transmission through this insect which unfortunately had been brought into our country by the fast French destroyers which transported the correspondence of the "Air France" between Dakar and Natal, a voyage of only four days. (2)

We tenaciously fought against this enemy and succeeded in dominating it in Natal, Ceará-Mirim and other points, but we could not complete the work and urgently called the Government's attention to the great danger threatening Brazil by the invasion of this mosquito. In public conferences and various publications we pointed out the danger of this disease extending to neighboring States, including Ceará, which State would inevitably be one of the first victims. These statements were made in October 1931 and repeated in an interview granted to the "Correio do Ceará", in November of that year.

This African mosquito is an extremely dangerous malaria vector. Research work by dissection showed percentages never before observed in other species. In specimens from Natal, Davis found 62.8% infected stomachs and 30.2% salivary glands. We continued research work in 162 specimens from Taipi and 235 from São Gonçalo, and obtained the following results:

Total dissections	With oocysts on the stomach	With sporozoites in the salivary glands
397	284, or 71.5%	112, or 28.2%

This suffices to show the capacity of malaria propagation of this culicoidae and the elevated hematologic virulence which develops in it easily and exuberantly in conditions favorable for its growth.

The importation into Brazil of this sinister insect represents one of the greatest misfortunes that could overcome our country, unless we take immediate and energetic measures, not sparing effort of expense.

According to an estimate made a long time ago, there exist in Brazil about 8 million malaria patients, but if "costalis" continues to spread over the country, in half a century only the ruins of our race will remain.

For the past seven years we have been fighting this mosquito and for the time being we have confined its activities to the States of Rio Grande do Norte and Ceara. There is still time to save the nation from the peril of this deadly malaria vector. We find it opportune to here transcribe the concluding words of our report, presented in 1931 to the then Minister of Education and Public Health: "Summarizing, we believe that there is still time to defend ourselves and to blockade the enemy. With the advances of preventive medicine, nothing would justify a hesitating action. Salvation will come from financial support which the Government should designate for this purpose. The indispensable budgets for this immediate and important health campaign will not be very heavy". (2)

#### RIO GRANDE DO NORTE

##### STRICKEN AREAS

The regions attacked at present in the State of Rio Grande do Norte are principally located in the Ceara-Mirim and Assu River valleys or the Piranhas River, and to a lesser extent in the Mossoró and Apodi river valleys, though old foci are still to be found along the banks of the Potengi River.

In the Ceara-Mirim valley, the points most attacked are the Ceara-Mirim, Taipi and Baixa Verde counties; in the Assu Valley, the river banks are completely infected, the left bank to an extension of more than 100 kilometers length by 30 wide, forming a large stretch between the town and the coast. This zone is densely populated, with 20,000 inhabitants. Among other small localities, we mention Nova Esperanca, Santa Luzia, Oficinas, Logradouro and Canto do Mangue; on the right bank of the river the counties of Macau, Angicos, Sant'Ana do Matto; in the Mossoró valley the counties of Areia Branca and part of Mossoró are also infected.

It is interesting to observe the march of the "Anopheles costalis" along the coast line, successively reaching the mouth of these rivers, and then turning to the Jaguaribe, in the State of Ceará.

#### TOTAL OF PERSONS AFFECTED BY MALARIA

The estimate of malaria cases which we present is based strictly on personal investigations and data gathered by various Federal and State Health officials in this region.

In the counties of Ceará-Mirim, in Taipú and Baixa Verde there occurred 13,000 cases; in Assu county 20,000, in Macau 3,500, Angicos 1,000, Sant'Ana dos Matos 9,000, Areia Branca 3,000, Mossoró 800; and in São Gonçalo and surroundings 1,500, giving a total of 51,500.

This number tends to increase daily, and one can count on a monthly increase of from 6 to 8%. Certain regions which up to now were spared will soon also be infected, as there are numerous points still free as yet from fever but already invaded by "Anopheles costalis". Among others, we mention vast areas in the counties of Macau and Mossoró.

#### MORTALITY

In Ceará, case fatality was high, but a certain variation in percentages was noted, according to the zones or regions studied. In the counties of Areia Branca and Mossoró, the epidemic has been benign, the mortality due to malaria not surpassing 6%, but already in Assu, the situation is becoming serious, as we find here 10% of fatal cases, and in the county of Macau the doctor in charge of the health service reports a mortality of 13%. Mortality in the Ceará-Mirim valley oscillates between 8 and 15%. Death registration in the interior is not on as efficient basis and we were therefore not able to gather accurate data from the registrars. However, careful estimates were made by doctors and inspectors of the Service, which give the number of fatal cases since the beginning of this year as: Ceará-Mirim, Taipú and Baixa Verde - 1,560; Assu - 2,100; - Sant'Ana dos Matos e Angicos - 980; Macau - 440; Areia Branca and Mossoró - 210; Total 5,290. In this total are not included data of various far distant localities.

#### SPLENIC INDEX

In the Assu valley region we carefully studied the degree and distribution of enlarged spleens. The index obtained without distinction of age was 74.2. Careful examination of

221 persons living in the localities of Santa Luzia (left river bank) and Sacramento, on the right bank, gave the following result: Enlarged spleen - 194; spleens not palpable - 27; with spleen no. 1 - 60; no. 2 - 50; no. 3 - 41; no. 4 - 3. Splenic index - 87.8; Ross index - 1.5; Parrot index - 131.7.

As it seems, in spite of a very high splenic index, the Ross index was relatively low, as there were very few large spleens. On the contrary, the greater part were no. 1 spleens and while there were a number of no. 2 and 3 spleens, no. 4 spleens were rare.

In patients examined in the Ceará-Mirim region we found a good number of no. 4 spleen. We did not cite this index as we thought the data obtained was not sufficient. It should be noted that malaria in this region is of much earlier date than in the Assu region.

## ENTOMOLOGICAL DATA

### 1. LARVAE STUDIES

The searches for *Anopheles* larvae were generally positive in the small and medium sized lakes. We found larvae of various sizes, some of the subgenus "*Nyssorhynchus*" and other of the "*Mycomyia costalis*". Rains hampered this search for larvae, which under more favorable conditions would have revealed more foci.

### 2. HOUSE CAPTURES

In captures effected in residences, *Anopheles costalis* was not only found in dwellings situated in the infected zones but also in various nearby localities which had not yet been affected by fever outbreaks. A much greater number of *Anopheles costalis* were found in the evenings than during daytime. On rainy days were rarely found any in residences.

### 3. NIGHT CAPTURES

In Santa Luzia (on the left bank of the Assu river) we made mosquito captures with animal bait early in the evening, employing a capture squad of four, using 2 horses. We did not expect positive results since we knew that *costalis* refuses animal blood, and were surprised to see a great number of *Anopheles* feeding on the horses. In less than 15 minutes we captured 23 specimens. Had it not been for an unexpected and heavy rain and the unrest of the horses, the number captured would have been much larger. Examination of the anophelines we had caught showed that all were of the subgenus "*Nyssorhynchus*", which confirmed our previous observations regarding A. costalis.